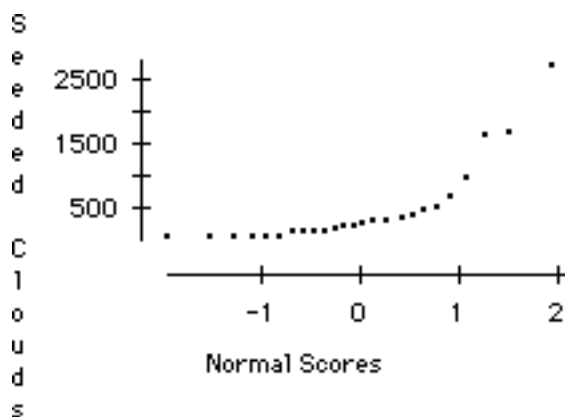


Multiple Choice Questions

Probability - Normal distribution

1. One of the side effects of flooding a lake in northern boreal forest areas (e.g. for a hydro-electric project) is that mercury is leached from the soil, enters the food chain, and eventually contaminates the fish. The concentration in fish will vary among individual fish because of differences in eating patterns, movements around the lake, etc. Suppose that the concentrations of mercury in individual fish follows an approximate normal distribution with a mean of 0.25 ppm and a standard deviation of 0.08 ppm. Fish are safe to eat if the mercury level is below 0.30 ppm. What proportion of fish are safe to eat?
 - (a) 63%
 - (b) 23%
 - (c) 73%
 - (d) 27%
 - (e) 37%
2. Refer to the previous question. The Department of Fisheries and Oceans wishes to know the mercury level of the top 20% of the fish. The appropriate percentile and mercury level for this lake is:
 - (a) 20th percentile has a value of -0.84 ppm
 - (b) 20th percentile has a value of 0.18 ppm
 - (c) 80th percentile has a value of 0.32 ppm
 - (d) 80th percentile has a value of 0.84 ppm
 - (e) 20th percentile has a value of 0.07 ppm
3. The following graph is a normal probability plot for the amount of rainfall in acre-feet obtained from 26 randomly selected clouds that were seeded with silver oxide:



- (a) The data appear to show exponential growth; that is, the amount of rainfall increases exponentially as the amount of silver oxide increases.
 - (b) The pattern suggests that the measurement is not normally distributed.
 - (c) A least squares regression line should be fitted to the rainfall variable.
 - (d) It can be expected that the histogram of rainfall amount will look like the normal curve.
 - (e) The shape of the curve suggests that rainfall is caused by seeding the clouds with silver oxide.
4. Marks on a Chemistry test follow a normal distribution with a mean of 65 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?
- (a) 11%
 - (b) 89%
 - (c) 15%
 - (d) 18%
 - (e) 39%
5. Refer to the preceding question. What is the approximate 90th percentile of the mark distribution?
- (a) 80
 - (b) 90
 - (c) 85
 - (d) 75
 - (e) 95

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6. The marks on a statistics test are normally distributed with a mean of 62 and a variance of 225. If the instructor wishes to assign B's or higher to the top 30% of the students in the class, what mark is required to get a B or higher?

(a) 68.7
(b) 71.5
(c) 73.2
(d) 74.6
(e) 69.9

7. The grade point averages of students at the University of Manitoba are approximately normally distributed with mean equal to 2.4 and standard deviation equal to 0.8. What fraction of the students will possess a grade point average in excess of 3.0 ?

(a) .7500
(b) .6000
(c) .2734
(d) .2500
(e) .2266

8. In some courses (but certainly not in an intro stats course!), students are graded on a "normal curve". For example, students within ± 0.5 standard deviations of the mean receive a C; between 0.5 and 1.0 standard deviations above the mean receive a C+; between 1.0 and 1.5 standard deviations above the mean receive a B; between 1.5 and 2.0 standard deviations above the mean receive a B+, etc. The class average in an exam was 60 with a standard deviation of 10. The bounds for a B grade and the percentage of students who will receive a B grade if the marks are actually normal distributed are:

(a) (65, 75), 24.17%
(b) (70, 75), 18.38%
(c) (70, 75), 9.19%
(d) (65, 75), 12.08%
(e) (70, 75), 6.68%

Refer to the previous question. Another Instructor decides that the lower B cutoff should be the 70th percentile. The lower-cutoff for a B grade is:

(a) 70
(b) 65
(c) 60

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- (d) 75
(e) 80
9. The diameters of steel disks produced in a plant are normally distributed with a mean of 2.5 cm and standard deviation of .02 cm. The probability that a disk picked at random has a diameter greater than 2.54 cm is about:
- (a) .5080
(b) .2000
(c) .1587
(d) .0228
(e) .4920
10. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. The number of students scoring between 70 and 82 is:
- (a) 272
(b) 164
(c) 260
(d) 136
(e) 328
11. Bolts that are used in the construction of an electric transformer are supposed to be 0.060 inches in diameter, and any bolt with diameter less than 0.058 inches or greater than 0.062 inches must be scrapped. The machine that makes these bolts is set to produce bolts of 0.060 inches in diameter, but it actually produces bolts with diameters following a normal distribution with $\mu = 0.060$ inches and $\sigma = 0.001$ inches. The proportion of bolts that must be scrapped is equal to:
- (a) 0.0456
(b) 0.0228
(c) 0.9772
(d) 0.3333
(e) 0.1667
12. The cost of treatment per patient for a certain medical problem was modeled by one insurance company as a normal random variable with mean \$775 and standard deviation \$150. What is the probability that the treatment cost of a patient is less than \$1,000, based on this model?
- (a) .5000
(b) .6826

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- (c) .8531
(d) .9332
(e) Cannot be computed without knowledge of additional parameters
13. The time that a skier takes on a downhill course has a normal distribution with a mean of 12.3 minutes and standard deviation of 0.4 minutes. The probability that on a random run the skier takes between 12.1 and 12.5 minutes is:
- (a) 0.1915
(b) 0.3830
(c) 0.3085
(d) 0.6170
(e) 0.6826
14. It is known that the resistance of carbon resistors is normally distributed with $\mu = 1200$ ohms and $\sigma = 120$ ohms. What proportion of the resistors have resistances that differ from the mean resistance by more than 120 ohms?
- (a) 0.9544
(b) 0.3413
(c) 0.1587
(d) 0.6826
(e) 0.3174
15. The time required to assemble an electronic component is normally distributed with a mean of 12 minutes and a standard deviation of 1.5 min. Find the probability that a particular assembly takes more than 14.25 minutes.
- (a) .9332
(b) .0668
(c) .3413
(d) .4332
(e) .1587
16. Heights of males are approximately normally distributed with a mean of 170 cm and a standard deviation of 8 cm. What fraction of males are taller than 176 cm?
- (a) .7500
(b) .6000
(c) .2734

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- (d) .2500
(e) .2266
17. The height of an adult male is known to be normally distributed with mean of 175 cm and standard deviation 6 cm. The 20th percentile of the distribution of heights is:
- (a) 175
(b) 179
(c) 170
(d) 172
(e) 174
18. The heights of students at a college are normally distributed with a mean of 175 cm and a standard deviation of 6 cm. One might expect in a sample of 1000 students that the number with heights less than 163 cm is:
- (a) 997
(b) 23
(c) 477
(d) 228
(e) 456
19. The height of an adult male is known to be normally distributed with a mean of 69 inches and a standard deviation of 2.5 inches. The height of the doorway such that 96 percent of the adult males can pass through it without having to bend is:
- (a) 1.8
(b) about 65
(c) about 74
(d) about 80
(e) about 58
20. The distribution of weights in a large group is approximately normally distributed. The mean is 80 kg. and approximately 68% of the weights are between 70 and 90 kg. The standard deviation of the distribution of weights is equal to:
- (a) 20
(b) 5
(c) 40
(d) 50

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- (e) 10
21. The distribution of weights of a large group of high school students is normally distributed with $\mu = 55$ kg and $\sigma = 5$ kg. Which of the following is true?
- (a) About 16 percent of the students will be over 60 kg.
 - (b) About 2.5 percent will be below 45 kg.
 - (c) Half of them can be expected to weigh less than 55 kg.
 - (d) About 5 percent will weigh more than 63 kg.
 - (e) All the above are true.
22. The daily milk production of Guernsey cows is approximately normally distributed with a mean of 35 kg/day and a standard deviation of 6 kg/day. The probability that a days production for a single animal will be less than 28 kg. is approximately:
- (a) .41
 - (b) .09
 - (c) .38
 - (d) .12
 - (e) .62
23. Refer to the previous question. The producer is concerned when the milk production of a cow falls below the 5th percentile because the animal may be ill. The 5th percentile (in kg) of the daily milk production is approximately:
- (a) 1.645
 - (b) -1.645
 - (c) 33.36
 - (d) 25.13
 - (e) 44.87
24. Which of the following is NOT CORRECT about a standard normal distribution?
- (a) $P(0 \leq Z \leq 1.50) = .4332$
 - (b) $P(Z \leq -1.0) = .1587$
 - (c) $P(Z \geq 2.0) = .0228$
 - (d) $P(Z \leq 1.5) = .9332$
 - (e) $P(Z \geq -2.5) = .4938$

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25. The measurement of the length of the index finger of a human right hand is a normally distributed variable with a mean of 6 cm. and a standard deviation of 0.5 cm. What is the probability that the finger length of a randomly selected person will be between 5 cm. and 7.5 cm.?
- (a) .9759
 - (b) .0241
 - (c) .9500
 - (d) 1.000
 - (e) not within ± 0.001 of these
26. Lice are a pesky problem for school aged children and is unrelated to cleanliness. The lifetimes of lice that have fallen off the scalp onto bedding is approximately normally distributed with a mean of 2.2 days and a standard deviation of 0.4 days. We would expect that approximately 90% of the lice would die within:
- (a) about 2.6 days
 - (b) about 3.9 days
 - (c) about 2.5 days
 - (d) about 2.7 days
 - (e) about 3.0 days